

## Social Values and the Governance of Science

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In recognition of the tensions between science and society (1), and as research increasingly enters value-laden areas, proposals have been made for scientists to engage with other communities on the ethical, legal, and social implications of science and technology (2) and for the “public voice” to be brought into the formative stages of decision-making (3). Such measures, it is argued, should result in socially viable paths for scientific innovation.

As a contribution to this debate, we present findings from representative and comparable social surveys (4) in the United States ( $n = 1200$ ), Canada ( $n = 2000$ ), and the European Union ( $n = 25,000$ ) on who the public thinks should make decisions on science policy and what criteria should guide such decisions. We then investigate how positions on science policy relate to people’s opinions about the utility and regulation of technological innovation.

Survey respondents were asked two forced-choice questions (4). First, should decisions about technology be left to the experts or based on the views of the public? Second, should decisions be made on the basis of scientific evidence or on moral and ethical considerations? Clearly, forcing a choice between the pairs of options precluded a middle way. But we wanted to find out in whom and in what type of evidence the public had most confidence. The responses to these questions allowed us to divide the public into four “groups” reflecting different principles of governance: scientific elitists opted for decisions taken on expert advice based on scientific evidence; moral elitists

opted for decisions taken on expert advice based on moral and ethical criteria; scientific populists opted for decisions based on average citizen’s views of the scientific evidence; and, moral populists opted for decisions based on the average citizen’s views of the moral and ethical issues.

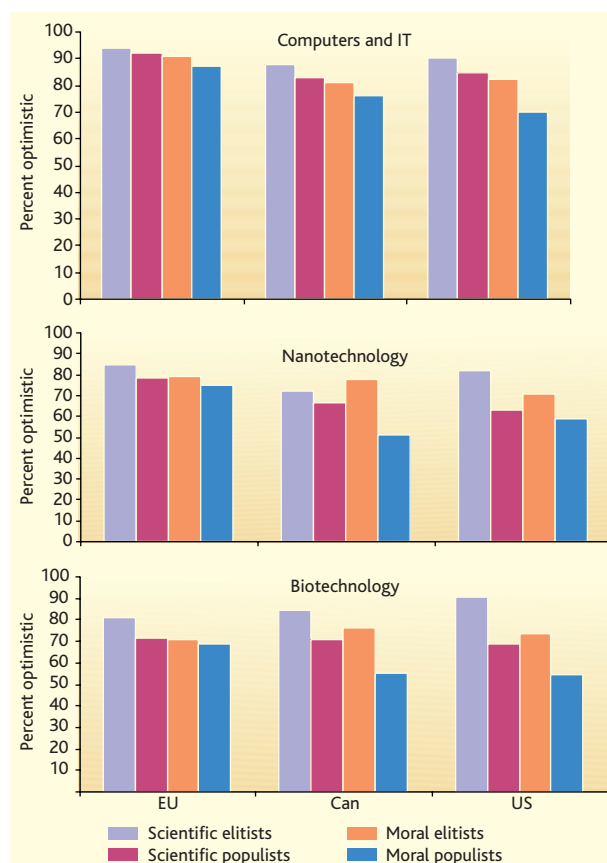
The distribution of people in the United States, Canada, and Europe who opted for each principle of governance is shown in the table (p. 1909). The scientific elitists were the largest group in the United States, Canada, and Europe (54, 49, and 52% respectively). Overall, two-thirds opted for a scientific basis to decision-making and just under three-quarters wanted experts to be in the driving seat. This can be read as a vote of confidence in “sound science.” But is it a ringing endorsement? Just over a third of respondents valued moral and ethical considerations over scientific evidence; one-quarter of respondents preferred the public over experts in decision-making.

Were these different positions on the governance of science related to people’s views about the utility of science? Survey respondents were asked whether they were optimistic or pessimistic about the prospects for society of three technologies—computers and information technology, biotechnology, and nanotechnology (see chart, this page).

For each technology, the scientific elitists were more optimistic than the other groups, with the exception of the Canadian moral elitists on nanotechnology. The moral elitists were generally more optimistic than the scientific populists about nanotechnology and biotechnology. Finally, the moral

populists were always the least optimistic of the four groups.

Furthermore, there were marked differences in optimism both between the scientific elitists and the moral populists, and among the United States, Canada, and Europe. The mean difference between scientific elitists and moral populists (across the United States, Canada, and Europe) was 13% for computers and IT, 18% for nanotechnology, and 26% for biotechnology. Thus, although the utility of computers and IT was relatively consensual, judgments about the societal contribution of biotechnology (and to a lesser extent nanotechnology) were more strongly associated with views on the governance of science.



A transatlantic divide was also apparent. The mean difference in optimism between scientific elitists and moral populists for the three technologies was greater for the United States (26%) and Canada (20%) than for Europe (9%). By implication, disagreements about the value implications of these technologies were stronger in North America than in Europe.

But is this plausible given the continued political conflict in Europe over the introduction of genetically modified (GM) crops and

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food? We think so, and have argued as such elsewhere (5). The survey question asked about “biotechnology” not GM. Since the de facto moratorium on GM crops was introduced in Europe in 1999, media coverage across Europe on the issue has declined (6) and the continued discussions in Brussels (including an unofficial lifting of the moratorium in 2004) have gone largely unnoticed by the public. Europeans have become more positive about biotechnology (4), seemingly associating it with the human genome project and medical applications, rather than agriculture and food biotechnologies.

What are the implications of the principles of governance for people’s views on regulation? Both GM food and stem cell research have stoked controversies about risks and benefits, moral and ethical issues, public consultation, and regulation. To determine how the different groups viewed the regulation of these technologies, respondents were given a brief description of stem cell research and GM food, and asked to choose one of the following alternatives: approve, approve with tight control and regulation, approve only in special cases, and not approve in any circumstances (4). For this analysis, we combined the first two of these response alternatives, because few chose unqualified approval, and the first two approximated current regulations.

Among the United States, Canada, and Europe, we found a relatively consistent pattern of response for stem cell research and GM food when comparing the scientific elitists and the moral populists (see table). The former were more likely to approve the applications than the latter. But even given tight regulation and control, Europe’s scientific elitists were less likely to support the two applications than the same groups in the United States or Canada.

In the last column of the table, we show a “controversy index,” which is the ratio of approval offered by the scientific elitists and the moral populists. As this index increases, it is more probable that the technology is controversial or likely to be so. On this criterion, stem cell research was more controversial than GM food, and for both technologies, the United States had the highest score.

For stem cell research, in both the United States and Canada, it seems that being critical of the reliance on scientific evidence (moral elitists) reduced the extent of support far less than being critical of the reliance on experts (scientific populists). For GM food, being critical of either scien-

#### PERCENTAGES APPROVING STEM CELL RESEARCH AND GM FOOD WITH TIGHT CONTROL AND REGULATION

	Scientific elitists	Scientific populists	Moral elitists	Moral populists	Controversy index*
Stem cell approval (%)					
EU	62	56	51	43	1.44
Canada	91	75	91	61	1.49
US	90	53	85	38	2.37
GM food approval (%)					
EU	48	41	36	37	1.30
Canada	62	44	51	45	1.38
US	76	54	57	40	1.90

\*The ratio of the percentages of scientific elitists and moral populists

tific evidence or of experts appeared to have a similar impact in terms of declining support. By contrast, in Europe, moral elitism was associated with a greater decline in approval than scientific populism for both stem cell research and GM food. The perceived absence of moral and ethical considerations in decision-making seems to be a greater concern in Europe than the absence of public participation. In summary, among the critics of sound science, it appears that in the United States and Canada, it is who decides rather than on what basis that is most important, while in Europe, it is the reverse—the grounds are more important than who makes the decision.

Finally, we explored the characteristics of people who opted for the different principles of governance. Common to the surveys were indicators of education, religiosity, age, gender, and a measure of institutional trust based on trust in politics and trust in the media. These characteristics were used as predictors of the groups using multinomial logistic regression. Here, one group—the scientific elitists—was used as the reference category, and we determined whether each of the three other groups differed significantly on any given characteristic, holding the other factors constant (4).

By comparison with the scientific elitists, the other three groups had lower institutional trust. Furthermore, with the exception of Canada, these three groups have lower educational achievement. Of particular note was the contrast between the United States on the one hand, and Canada and Europe on the other. In the United States, religious beliefs were strongly related to critical attitudes to science and technology. For both the scientific and moral populists in the United States, it was the combination of strong religious beliefs, lower educational achievement, and lower generalized trust that most clearly distinguished them from the scientific elitists. Although Miller (7) showed that in the past

the U.S. public consistently reconciled conflicts between science and faith in favor of science, is this still true?

In summary, we found a majority in favor of current science policy, with this group seeing more utility in technology and more likely to approve technologies within current regulations. We also found a minority in favor of ethically informed decision-making and public engagement in science, with less positive views about technology, in particular emerging and controversial technologies.

What are the implications for science policy? Some might argue that because current policy achieved majority support, the status quo should prevail. But such an approach might be shortsighted for the following reasons.

First, there is the risk of alienating the more moderate sections of the minority, whose position finds support in influential journals, including *Science* (2). A positive response to their desire for greater involvement and more consideration of the moral and ethical issues may make a significant contribution to building trust in science policy.

Second, people ask: “What sort of society do we want, and how can new technology help in achieving it?” These are questions about ethics and social values; science alone cannot answer them. The public expect and want science and technology to solve problems, but they also want a say in deciding which problems are worth solving. This is not a matter of attracting public support for an agenda already established by science and scientists, but rather of seeing the public as participants in science policy with whom a shared vision of socially viable science and technological innovation can be achieved.

#### References and Notes

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8. Support for this project is acknowledged from Genome Canada, the Canadian Biotechnology Strategy Fund of the Government of Canada, and the Directorate General for Research, European Commission.

0.1126/science.1119444

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